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N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

Contributors

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
**Causality**

A \[\rightarrow\] B
Pressure \[\rightarrow\] Ulcer

**Multicausality**

Years smoking
High fat diet \[\rightarrow\] Heart disease
Limited exercise
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

• Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?
- No
- Yes

Is the primary purpose examination of relationships?
- No
- Yes

Descriptive Design
- No
- Yes

Will the sample be studied as a single group?
- No
- Yes

Correlational Design

Quasi-Experimental Study
- No
- Yes

Will a randomly assigned control group be used?
- No
- Yes

Is the original sample randomly selected?
- No
- Yes

Experimental Study
Selecting a Descriptive Design

1. Examine sequences across time?
   - Yes
     - Following same subjects across time?
       - Yes
         - Single unit of study
       - No
         - Studying events partitioned across time?
           - Yes
             - Repeated measures of each subject
           - No
             - Trend Analysis
     - No
       - Data collected across time
         - Yes
           - Longitudinal Study
         - No
           - Cross-sectional design

2. One group?
   - No
     - Comparative Descriptive Design
   - Yes
     - Descriptive Design
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

**Phenomenon of Interest**
- Variable 1
- Variable 2
- Variable 3
- Variable 4

**Description**
- Description of Variable 1
- Description of Variable 2
- Description of Variable 3
- Description of Variable 4

**Interpretation of Meaning**

**Development of Hypotheses**
A Comparative Descriptive Design

- **Group I** {variables measured} → **Describe** → **Comparison of Groups on Selected Variables** → **Interpretation of Meaning** → **Development of Hypotheses**
- **Group II** {variables measured} → **Describe** → **Comparison of Groups on Selected Variables**
Selecting the Type of Correlational Design

- Describe relationships between/among variables?
  - Descriptive correlational design

- Predict relationships between/among variables?
  - Predictive correlational design

- Test theoretically proposed relationships?
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1 → Description of variable

Examination of Relationship

Research Variable 2 → Description of variable

Interpretation of Meaning

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Repeated Measures?
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
                - One group pretest/post-test design
              - Yes
                - Compare treatment & control conditions?
          - Yes
            - Pretest?
Selecting The Type of Experimental Design

- Pretest
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Randomized clinical trials
              - Yes
                - Comparison of multiple levels of treatment
                  - No
                    - Examination of complex relationships among variables in relation to treatment
                  - Yes
                    - Nested Designs

## Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>PRETEST</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

### Treatment:
Under control of researcher

### Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

### Example:
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

### Uncontrolled threats to validity:
- Testing
- Mortality

### Instrumentation
- Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
### Nested Design

<table>
<thead>
<tr>
<th>Pain Control Management</th>
<th>Primary Nursing Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Care</td>
</tr>
<tr>
<td>Traditional care</td>
<td>Unit A</td>
</tr>
<tr>
<td>PRN Medication</td>
<td>Unit B</td>
</tr>
<tr>
<td></td>
<td>Unit C</td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit D</td>
</tr>
<tr>
<td></td>
<td>Unit E</td>
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<tr>
<td></td>
<td>Unit F</td>
</tr>
<tr>
<td></td>
<td>Unit G</td>
</tr>
<tr>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design